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METHODOLOGY OF MANPOWER FORECASTING

By International Labour Office

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METHODOLOGY OF MANPOWER FORECASTING

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Introduction

(1) What precisely are manpower requirements for economic development? And for what purposes are forecasts of these requirements needed? Consideration of these questions appears to be an essential preliminary to a discussion of the methods by which such assessments may be made in the practical situation.

(2) The process of economic development is not usually found to be operating throughout the whole of an underdeveloped economy. Although in some areas the demarcation line may not be very clear, as a rule it is possible to identify a modern or modernising sector, which may cover a wide range of industrial activities including agriculture, where more advanced methods of organisation, capital or techniques are being introduced, are in use or are being added to, and where manpower with education and/or occupational skills is required and is often in short supply; and a traditional sector where traditional technologies are used, where labour-capital ratios are high, and where skills are elementary or obtained by traditional methods. Assessment of manpower requirements is particularly relevant in the modern sector, which covers the greater part of employment of non-traditional skills.

(3) Another consideration is that information about manpower requirements cannot, in isolation, be placed to very useful purpose. The significant data are manpower requirements in relation to manpower resources, i.e. manpower surpluses or shortages. Such data are needed mainly on (a) the total manpower surplus or shortage, in order to determine the desirable employment impact of economic development; and (b) shortages or surpluses of manpower having certain occupational skills and educational levels, in order to test the feasibility of a planned or expected rate and type of economic development, as part of the basis for measures to change the occupational and educational pattern of the manpower available, or alternatively to change the rate and type of economic development. The present paper deals with the latter aspect and methods for making such assessments.

(4) The time period for which information is required is also pertinent. Thus, forecasts a few years ahead are needed to make decisions about the numbers to be guided into training for various types of occupations; to assess the number of scholarships to be given for training for various occupations in institutions at home or abroad; to assess the need for accelerated training courses; to vary the type of vocational training available locally; or to make changes in the phasing and geographic distribution of economic development. And forecasts about the long-term future are required as a basis for broad educational and vocational training planning, including decisions on educational capital investment and the training of educators and if necessary to recast long-range economic development plans in light of the possibilities of the future manpower situation.

(5) A last consideration relates to the degree of precision necessary in assessment. This tends to fall as the period of the forecast extends into the future. While relatively precise data are required about the short-term future, as the basis for specific operating decisions, somewhat less precision in longer-term forecasts can be tolerated, because they are used to influence broad patterns of development and the lines of action can often be varied or precised as the situation progresses. This points, however, to the need for regular review of long-term forecasts so that they may be adjusted as the future unfolds.

I. FORECASTING MANPOWER REQUIREMENTS

The Development of Labour Input Coefficients

(6) Experiences made in some countries to forecast future manpower requirements or requirements for high-level personnel on the basis of expectations of employing establishments regarding their future manpower demand have shown the lack of reliability of this method, even over short periods ahead. It is increasingly accepted, therefore, that such forecasts need to be related to future economic growth, through the application of suitable labour input coefficients to planned or expected output in various economic activities. Obviously, the narrower the classification of activities for which output forecasts are made or output targets fixed, the more industry-specific will be the labour coefficients applied and hence the more accurate the forecasts of requirements.

(7) The development of labour input coefficients showing the occupational composition and the proportion of manpower in significant occupations for each economic activity, and relating them to output, therefore, seems to be the crux in preparing forecasts of manpower requirements. There appears to be no alternative but to make forecasts of future coefficients, initially, on

the basis of current coefficients. To calculate these, various sources may be used. The census often provides information on the industrial-occupational distribution of the labour force in the economy as a whole, although it may sometimes be necessary to go to census tabulations to extract these. Between census periods measurements can be obtained from labour force sample surveys, but because of limitations imposed by sampling techniques, only for very broad industrial and occupational classifications. In contrast, data from establishment inquiries, supplemented where necessary by data about the skilled self-employed, can be organised to provide industrial-occupational analyses at almost any degree of detail of classification. Data from establishment inquiries normally relate to the modern sector of the economy chiefly, but this may not be a major drawback, since as we have seen it is in that modern sector that skilled and high-level personnel are mainly concentrated. Moreover, establishment inquiries, particularly when conducted in part by interview, are a source of information on many of the factors influencing manpower distribution and utilisation, e.g. the types of equipment used, etc. Such information is essential in interpreting current labour coefficients and adjusting them for the future. In making these adjustments the manpower forecaster is confronted with certain problems and must keep in mind certain considerations which may be summarised here.

(8) Manpower supply effects. The pattern of current employment is not independent of the manpower currently available and adjustments on this account to current labour input coefficients have to be made before they can be used as a basis for forecasting. In particular, shortages of skilled manpower may cause employing establishments to have a less efficient arrangement of work and consequently occupational pattern from that which would obtain if manpower with the required skills were available. Judgments about the extent to which this is happening may be made on the basis of changes establishments indicate they would make should manpower with different skills become available. However, this information has to be checked through research: establishments may have become so used to making do without the required complement of skilled manpower that the current occupational pattern may appear normal to them.

(9) More reliable information may be obtained where significant differences in occupational patterns occur in establishments with similar technologies in the same locality, indicating that different manpower supply effects are operating: sometimes it is possible to identify employing establishments which for various reasons are preferred by the scarce trained manpower available and where, consequently, the occupational structure is more a result of manpower demand than manpower supply influences. The extent of manpower supply effects can also be gauged by comparison of local occupational patterns with those found in establishments with similar technologies operating in countries where skilled manpower is not in short supply.

(10) Changes in technologies. Current labour input coefficients for each economic activity have also to be adjusted to allow for likely changes in technologies over the forecast period. In countries where economic development planning takes place, the output plans will have taken into account the likely future capital-output ratios; and the technological assumptions of economic development planning and manpower forecasting have to be co-ordinated.

(11) If, however, no information is available on the technological changes to be introduced, the manpower forecaster must try to determine them himself. Generally the impact of changing technologies upon labour input coefficients might be predicted by extrapolating past trends, and possibly adjusting them by some coefficient to take into account a particular growth path which has been accepted by the country concerned. However, data on past trends are rarely available, particularly in developing countries, and at the present stage of research a more disaggregated approach may be preferable. Some suggestions are made in the following paragraphs.

(12) It appears likely that the imponderables might be significantly reduced and research facilitated if separate forecasts are made for the modern and the traditional sector. For the traditional sector forecasts it might often be sufficient simply to use current undifferentiated labour coefficients; this would of course involve the assumption that ratios between the labour inputs and other inputs will remain constantly high and input-output ratios low. Where processes are operating which are likely to change coefficients in the traditional sector significantly, e.g. instruction in improved farming methods or increase of transport facilities or other external economies, it is necessary to undertake research in an attempt to make adjustments to them.

(13) Establishment inquiries provide a vehicle for obtaining information about current technologies in establishments in the modern sector as well as about the manpower associated with them; and this provides a basis for predicting change. In establishments with higher capital-output ratios, technologies tend to remain relatively unchanged at least until the capital is substantially replaced. The life of the capital is determined, particularly in lesser developed economies, largely by rising maintenance costs as it ages, although changes in the factor and commodity markets are also pertinent. With regard to the capital likely to be replaced during the forecast period and the incremental part of the forecast capacity, technological expectations have to be formulated.

(14) In doing so government policies may provide guides. In some activities labour-intensive methods of production may be fostered: for example feed-back devices, transfer machines, automated office equipment, production lines or mechanical earth-moving and road-making equipment may be discouraged. In some

other activities, low labour input-output ratios may be tolerated or even encouraged where they are necessary to achieve high capital-output ratios and thus the greatest return on scarce investments. In other activities still, countries may be endeavouring to develop entirely new types of technologies that are more suited to their needs.

(15) Where technologies are not controlled the more profitable tend to develop (subject to the availability of capital), especially where products are in competition with those of other countries. In the absence of data on which to assess the relative profitability of different technologies, it may be sufficient to assume that the more advanced technologies found in existing employing establishments are also the more profitable; or, in economic activities new to the country, those used abroad which are consistent with the inputs likely to be available locally.

(16) In some activities there is no alternative to high labour-capital ratios and substitution between labour and capital is not significant. These include administrative and professional services which are large employers of highly skilled manpower. However, in many service activities there may be a discernible sequence in the technical specialisation of manpower required: the elementary techniques may tend to be adopted before the more advanced (e.g. general dental practitioners may be expected to precede exodontists); in many cases the adoption of one set of techniques must be associated with others (e.g. general banking services and central banking); and the adoption of some techniques depends upon the types of manufacturing, construction and farming activities being developed (e.g. consulting engineering and architectural services and agricultural departments).

(17) Changing efficiency. In adjusting labour input-output coefficients allowances must also be made for changes in efficiency coming from such factors as external economies, improvements in skills and improvements in the organisational structure of establishments and managerial methods. In fact some of these changes can be more significant quantitatively than those coming from technological considerations. There appears to be a need for the development of indices on the basis of which changes in the efficiency of establishments can be taken into account.

Some Special Considerations Applying to Short-Term Forecasts

(18) It is clear from what precedes that, even though research will gradually increase the reliability of labour input coefficients by throwing light on the factors that cause them to change over time, it will probably never be possible to predict accurately the exact course of these factors, and hence there will always be some margin of error. Although in long-term forecasts the margin of error will tend to increase, it would

appear that this would not be too important since in most cases it would be sufficient for such forecasts to give broad indications as a basis for determining the main lines of educational and training policies, rather than for specific target-setting regarding the output of various educational and training institutions.

(19) Short-term forecasts, on the other hand, are used for the latter purpose but fortunately also the imponderables are reduced: in the short term not only is it likely that there will be plans covering a fairly broad area of the determinants of manpower requirements, but access is available in many cases to concrete investment and technological proposals. Several methods of identifying such proposals are available. Establishment inquiries can be used amongst existing employing establishments in the government and private sectors. Information about new private establishments likely to be set up can be obtained from records of industrial development or other authorities. In addition, there will often be programmes indicating public works to be undertaken or government services to be provided, or setting capacity targets for certain activities, e.g. for certain manufacturing activities, for a certain density of medical practitioners in the population, for certain tourist facilities, for certain water reticulation standards. Moreover, where actual projects are being considered the types of manpower that will be required can be judged from the capital equipment to be used or, with regard to services, the techniques involved.

(20) Such plans or proposals are rarely comprehensive for the whole economy. They may also be insufficiently co-ordinated and lack consistency either among themselves or in relation to actual economic potentialities and needs. They must, therefore, be used with caution. But if examined critically they can provide a basis for adjusting and precising the manpower forecasts based on macro-economic forecasts of future production, and they help in determining areas for priority action in the manpower field.

Forecasts of Educational Requirements

(21) The pattern of educational levels likely to be required at the workplaces by a future labour force has to take into account the likely occupational distribution of that labour force. To relate the occupational pattern to education, an index has to be drawn up indicating the types and levels of education which are currently, or are in future likely to be, regarded as a necessary preliminary to entry to occupations. On this basis occupations can be grouped in such a way that each group includes only occupations for which the same type and level of education is a prerequisite. In forecasting educational requirements, however, allowance must be made for the fact that as long as the supply of manpower with the required

educational qualifications will be inadequate - a situation which prevails in most developing countries - there will be great flexibility in the application of criteria for admitting workers on the basis of their educational attainments. The manpower forecaster in formulating educational requirements will therefore need to phase them in such a way as to allow for a gradual rise in the qualifications of manpower wherever necessary.

II. FORECASTING MANPOWER RESOURCES

(22) Changes in the occupational pattern of the more highly skilled labour force are determined largely by training at home or abroad; the migration of qualified persons; wastage from the occupation because of death, permanent illness, marriage or retirement from the labour force; and transfers to and from other occupations.

(23) For professions and technical occupations and crafts where institutional training or apprenticeship is a usual prerequisite, the likely increment can be estimated for a number of years ahead equal to the length of the formal training period, on the basis of the number studying for qualification in the occupation in each adademic year, and the failure and wastage rate. With regard to institutions abroad, estimated future outflows of qualifying nationals have to be adjusted to allow for those not likely to return to their home country to work. The causes of such wastage need to be studied not only in order to improve forecasting, but also as a basis for corrective measures.

(24) If forecasts of the labour force by occupational categories are further ahead than the length of the training period, an added factor for estimation is the likely training intake. Where training is obtained principally in institutions, the upper limit of future intakes is set by the future number of training places forecast. Assumptions about the extent to which the places will be taken up need, of course, to be consistent with forecasts of persons attaining the required educational level. Estimates of future training of nationals in institutions outside the country can be based partly upon the number of government and other scholarships planned for this purpose. Allowance has to be made for non-scholarship training abroad, and, particularly if local training facilities are expanding, past trends have to be adjusted in doing this. With regard to apprenticeship and other training where there is a recognised "on-the-job" training period, estimates of future training intakes must take into account the availability of qualified craftsmen to provide such training and suitable ratios between qualified workers and trainees.

(25) In skilled occupations where there is no recognised period of training, but where entry is usually by progression through an organisational or occupational hierarchy (e.g. certain adminisstrative occupations) assessments of growth, even if they could be made with precision, are probably superfluous. It is probably

more important to assess the quality of such workers at various hierarchical levels, with a view to determining needs for improving basic educational facilities or for managerial development or other training courses.

(26) Any attempt to forecast migration must take into account government attitudes towards immigration, which may be fostered or accepted for certain occupations but discouraged for others. Consideration must also be given to the extent to which skilled workers and high-level personnel are likely to accompany direct foreign investment. Trends in the emigration of skilled nationals and likely changes in government policies towards this type of emigration and the possible impact of increasing employment opportunities in their home countries have to be taken into account. Forecasts also involve judgments about changes in policies which influence the tenure of skilled or high-level expatriates.

(27) Persons leave the labour force principally because of death, age, marriage or permanent illness. If vital statistics show deaths classified by age and occupation of the deceased they may be used in forecasting losses due to death in future years in individual occupations; they can be adjusted, if necessary, for expected changes in death rates over the forecast period. However, such detailed statistics are rarely available in developing countries, and death rates for the population as a whole will probably have to be used. For high-level occupations, these may need to be adjusted having regard to the fact that people in these occupations usually enjoy better living conditions and have a higher life expectancy than the rest of the population. Similarly, retirements can be estimated by applying the average retiring age in the country, but research may show for manpower in the more highly skilled occupations significant departures from this average. Loss because of illness or marriage can only be allowed for on the findings of research.

(28) It appears likely that transfers between the more highly skilled occupations comes principally from upgrading. The extent to which this is current can be assessed from establishment inquiry data: its incidence in the future will obviously be influenced by the relative availabilities of manpower in the occupations concerned.

III. COMPARISON OF MANPOWER REQUIREMENTS AND RESOURCES

(29) The forecasting of manpower shortages and surpluses involves a preliminary comparison of forecast requirements and resources, to obtain a first indication of the likely future situation. In the light of this, assumptions that had been made about many of the unplanned elements in the forecast of manpower requirements and resources (e.g. technological

assumptions, the extent of upgrading, the migration of skill, the return of nationals on completion of training abroad) may need to be revised since these factors may be influenced by the actual development of labour supply and demand in individual occupations. Thus, by a process of gradual refinement and adjustment, final forecasts of manpower shortages and surpluses are made.

(30) Obviously, when on the basis of these forecasts changes are made in current plans or policies, these changes need to be studied in order to determine all their possible repercussions on future manpower situation, i.e. the forecast must be revised.

(31) In practice, the process of comparing manpower requirements and resources cannot be a precise one. Even where there are comprehensive manpower measurements and forecasts, data seldom dovetail closely (there usually are differences in coverage, in classification, in time periods to which data relate) and the reliability of data varies. Imprecision can be reduced to an extent by good measurement techniques, the use of uniform industrial and other classifications, and attention to the timing of measurements.

(32) Comparisons by occupational categories are usually required for many, perhaps most, professional and technical occupations and also for many crafts and other skilled occupations. The degree of precision of assessment will have to be greater for the more highly skilled occupations because institutional training has to be planned well ahead and, for these workers, occupational mobility is likely to be fairly low outside the occupational functions for which their education fits them. However, as we have seen, even for those categories the breadth of occupational classification for which assessment needs to be made tends to increase with the period forecast.

(33) Requirements for workers in skilled occupations can be assessed for each geographic area and industry for the short and long-term future to the extent that output can be forecast for regions. However, future manpower resources cannot be allocated between industries and geographic areas: where over-all shortages exist, the available workers will tend to enter those establishments which offer the greatest net advantage in employment.

(34) In forecasts for a specific occupation there may sometimes be a need to allow for a frictional imbalance, and the likely development of the employment service may need to be taken into account in doing this, since it is likely to reduce such imbalances.

IV. INTERPRETATION OF MANPOWER FORECASTS

(35) Apart from their intrinsic limitations, forecasts of the manpower likely to be required and available for economic development cannot be expected to materialise to any greater extent than the plans and expectations upon which they are based.

In the practical situation these are subject to continual review and variation; moreover, unforeseen influences are constantly changing the size and composition of the manpower resources. Manpower forecasts must be interpreted on the basis of the likely reliability of the data on which they are formed, and this involves the extent to which the ever-changing data are incorporated in revised forecasts.

(36) Also forecasts must be interpreted not with regard to an isolated point of time, but taking into account the current and shorter-term situation leading up to the forecast date. Obviously skilled manpower resources cannot to any significant extent be stockpiled awaiting the development of forecast requirements; the process of balancing manpower requirements and resources is essentially one of balancing their flow over a period of time. Forecasts of the manpower likely to be required and available for economic development have also to be interpreted remembering that the short-term demand situation is likely to vary over the period to which forecasts apply.

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